

Remarks

Upon entry of the instant amendment, Claims 1-6, 12-15 and 28-31 are pending. Claims 1, 13 and 28 have been amended to more particularly point out the Applicant's invention. The Applicant notes with appreciation the acceptance of the drawings filed on August 28, 2001. It is respectfully submitted that the application is in condition for allowance.

Claim Rejections- 35 USC § 112

Claim 13 has been rejected under 35 USC § 112, second paragraph for allegedly failing to particularly point out the applicant's invention. Claim 13 has been amended to overcome this rejection. Accordingly, The Examiner is respectfully requested to reconsider and withdraw this rejection.

Claim Rejections- 35 USC § 103

Claims 1, 6, 14, 28 and 32 have been rejected under 35 USC §103 as being unpatentable over Thorson US Patent No. 6,101,225 ("the Thorson patent") in view of Horiguchi et al US Patent No. 6,133,791 ("the Horiguchi et al patent") and further in view of Pitel US Patent No. 4,661,897 ("the Pitel patent"). It is respectfully submitted that none of the cited references , either singly or in combination, disclose or suggest the inventions recited in the claims.

In particular, the invention relates to a system and method to reduce output power spurs resulting from mixing an input RF or microwave signal having a frequency f_1 with a local oscillator (LO) signal having a frequency f_2 to change the frequency of the input signal. For example, as discussed in the specification and is well known in the art, when a mixer is used as an up-converter, the output of the mixer is $f_1 + f_2$. Similarly , when a mixer is used as a down-converter, the output of the mixer is $f_1 - f_2$ or $f_2 - f_1$. Unfortunately, the mixers also generate unwanted spurious output signals at different frequencies , normally called spurs, in addition to the up-converted or down-converted signals. The spurs are normally filtered out by filters. In some instances, some of the spurs are difficult if not impossible to filter out.

The present invention reduces the spur signals without the aid of a filter. In particular, the system utilizes two mixers in tandem in which the output of the first mixer is received as an input

to the second mixer. The first mixer mixes an input RF or microwave signal with a LO signal that is modulated with a pseudo-random (PN) number. The output signal from the first mixer is mixed with an LO signal that is inverse modulated by the same PN number. The output signal of the second mixer provides a signal with reduced spurs.

Turning to the specific rejection, none of the references cited either singly or in combination, disclose or suggest a method of reducing spurious output signals in a mixer. As will be discussed in more detail below, even though the cited references disclose the use of two (2) mixers in one application.

In particular, the Applicant agrees that the Thorson patent does not disclose or suggest modulation of a local oscillator signal and mixing it with an input signal. The Thorson et al patent discloses a circuit with two (2) mixers; however, unlike the invention, the outputs of the two (2) mixers are combined together in a “combiner”.

The Horiguchi et al patent was cited for disclosing modulation of a local oscillator signal with a pseudorandom number and mixing that signal with an input signal. The Horiguchi et al patent only discloses a single mixer.

The Pitel patent was cited for teaching “a second modulator (which) is an inverse modulator (inverter 17 in fig. 7) for modulating a LO signal (the output from oscillator 12 in fig. 7) using the same pseudorandom code as the first modulator (it would be obvious that modulators 17 and 18 use the same received pseudorandom code).” The Applicant respectfully disagrees with the Examiner’s assessment of the Pitel patent. In particular, the Pitel patent discloses in Fig. 8(b) mixing two phase modulated signals $V_1(\omega t)$ and $V_2(\omega t)$ in a single mixer. The applicant agrees that one signal is phase modulated while the other is inverse phase modulated. There is no teaching or suggestion in the Pitel patent to use two (2) mixers or to connect two(2) mixers in tandem as recited in the claims at issue. In fact none of the references disclose or suggest using two (2) mixers and coupling the output of a first mixer to the input of a second mixer to reduce spurious output signals in the output of the mixer.

Claims 2-5, 12, 29 and 30 have been rejected under 35 USC §103 as being unpatentable over the Thorson, Horiguchi et al and Pitel patents further in view of Underbrink et al US Patent No. 6, 754,287 (“the Underbrink et al patent). It is respectfully submitted that none of the cited references, either singly or in combination, disclose or suggest the inventions recited in the claims. Claims 2-5, 12, 29 and 30 are all dependent claims, dependent on either Claim 1 or

Claim 28. The Thorson , Horiguchi et al and Pitel patents have been discussed above. The Underbrink et al patent was cited for disclosing a PSK modular. It does not otherwise disclose a tandem configuration of mixers as recited in claims at issue. For these reasons and the above reasons, the Examiner is respectfully requested to reconsider and withdraw this rejection.

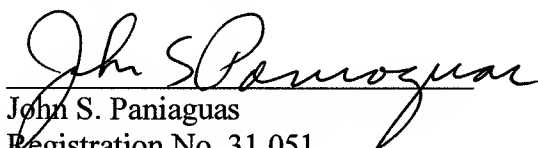
Claims 15 and 31 have been rejected under 35 USC §103 as being unpatentable over the Thorson , Horiguchi et al and Pitel patents further in view of Scott US Patent No. 5,784,403 ("the Scott patent). It is respectfully submitted that none of the cited references , either singly or in combination, disclose or suggest the inventions recited in the claims. Claims 15 and 31 are dependent claims, dependent on either Claim 1 or Claim 28. The Thorson , Horiguchi et al and Pitel patents have been discussed above. The Scott patent was cited for disclosing a GMSK modular. It does not otherwise disclose a tandem configuration of mixers as recited in claims at issue. For these reasons and the above reasons, the Examiner is respectfully requested to reconsider and withdraw this rejection.

CONCLUSION

Based on the above, it is respectfully submitted that none of the references , either singly or in combination disclose or suggest the configuration of the mixer circuit recited in the claims that effectively reduces spurious output signals. The Examiner is respectfully requested to requested to provide favorable consideration of the pending claims base upon the instant amendment and the remarks above.

Respectfully submitted,

KATTEN MUCHIN ROSENMAN LLP

By: 
John S. Paniaguas
Registration No. 31,051
Attorney for Applicant(s)

Katten Muchin Rosenman LLP
2900 K Street, NW
Suite 200
Washington, DC 20007-5118
(312) 902-5200
(312) 902-1061
Customer No.: 27160